Compilation of current experimental nuclear structure & decay papers: XUNDL database and its uses

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(presented by F.G. Kondev (ANL))

XUNDL: purpose and scope

- E<u>x</u>perimental <u>U</u>nevaluated <u>N</u>uclear <u>D</u>ata <u>L</u>ist. Started in 1998 at McMaster University in response to recommendations of an advisory panel for data program set up by Office of Science, DOE in 1997. (High-spin data in ENSDF were not up-to-date).

- Provides prompt access to nuclear structure data in current publications through on-line retrieval system at NNDC, BNL webpage: http:www.nndc.bnl.gov/xundl/. Also through RADWARE level-scheme database at ORNL

- Complements ENSDF database, where data for some of the nuclides may be several years old and outdated.

- ENSDF-formatted datasets compiled from one paper, or a set of related papers from the same group.

Purpose and Scope

- Priority given to papers in PRL, PR-C, EPJ-A, NP-A, PL-B, JP-G, IJMP-E, and some others through frequent scans of journal web pages.

- Serves as a repository of relevant data details which do not appear in publications. John Schiffer's group from ANL, with pre-arrangement, sent data tables and other details for 4 of their papers in PRL/PRC in 2008-2010 to include only in XUNDL.

- At the request of the researchers, unpublished data for completed studies or from preprints can also be included in the XUNDL database.

Procedure for papers with extensive data

- Commercial code Finereader / Adobe-xx Professional used to create tabular text files from PDF files downloaded from journal web pages

- TABULAR-TEXT to ENSDF conversion code, developed at McMaster, used to generate draft ENSDF-formatted datasets

- Datasets run through codes FMTCHK and GTOL; for decay datasets BrIcc and LOGFT codes are also used

- Level schemes, bands and numerical data in the compiled dataset run through the ISOTOPE-EXPLORER code and/or PANDORA

- Finally all data sets are checked manually

- Data-related inconsistencies and requests for additional data are handled through frequent e-mail communications with original authors

Undergraduate student participation

- At McMaster, where majority of the compilation work has been done over the past 12 years, it has been possible only through the participation of undergraduate students at first and second year level. On an average, two students work full-time during summers and part-time (~6 hours/wk) during semesters. Besides XUNDL, they get involved with other data-related projects as well such as NSR key-wording, code writing, etc.. They also get an opportunity to participate in experiment runs with Alan Chen's group. They get training in basic nuclear physics, ENSDF formats, use of computer codes for structure evaluations, etc. For a large number of papers, draft datasets are prepared by the students, which are then checked by B. Singh prior to inclusion of these datasets in XUNDL.

- Recently, at ANL, William Murrey, undergraduate at DePaul Univ. has started compilation work for XUNDL.

Current contents of XUNDL

- **4360** compiled datasets

- **2024** nuclides: ^{1}H to ^{294}118, spread over **273** isobar-chains;

- Data from **2840** primary journal articles published during 1995 – 2011

- Since 1999, about **450** communications with the original authors to resolve data inconsistencies and to obtain additional data details. This part of the activity is considered important for archiving unpublished data and documentation of data-related inconsistencies. It is also beneficial to future ENSDF or other evaluations.

Papers in XUNDL database by year

Total number of papers=2840
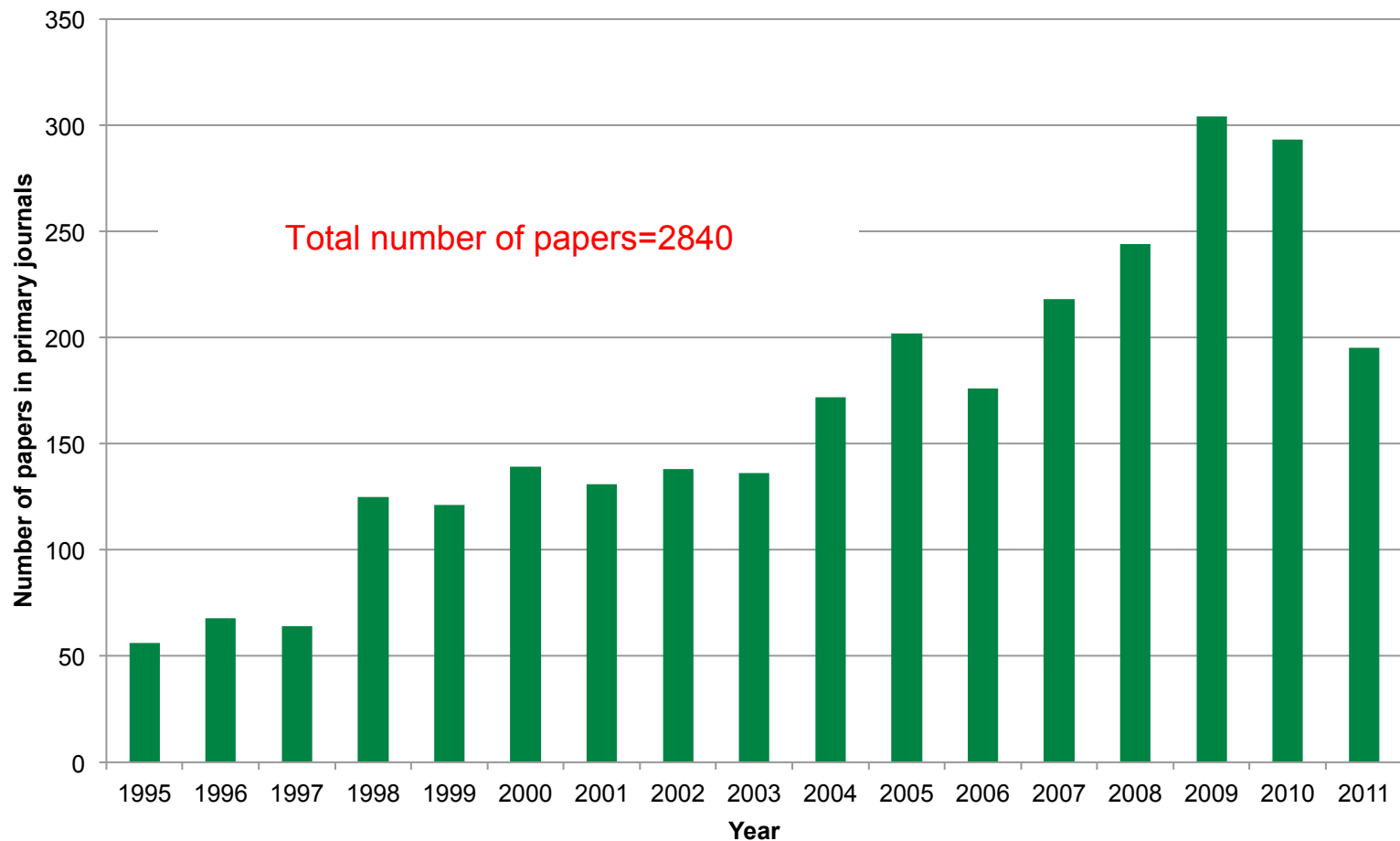
Use of the database

- Active communication with the original authors is helpful on both sides: data evaluators and researchers. Although, the database is called "unevaluated", but each dataset is prepared by a critical reading of the paper, and consistency checks are done through a suit of computer codes used routinely in evaluation procedures.

- At national and international nuclear physics conferences, many researchers, especially graduate students and post-doctoral fellows, mention their regular use of XUNDL database during the planning and running of their experiments.

Future Developments

- At various labs and conferences, researchers have pointed out that XUNDL does not have retrieval features as for example ENSDF database has NuDat as a search engine.

- With more than 4300 datasets in the database, it would make sense to put some effort in the development of searching capabilities for XUNDL & such discussions are on-going

XUNDL collaboration team

- **McMaster:** Michael Birch(*), Jeremie Choquette(*), Jun Chen, Balraj Singh.
  Collaboration with: Khalifeh Abusaleem (U. of Jordan),
  Kazek Zuber (PAN, Krakow)

- **TUNL:** John Kelley, Grace Sheu, Jim Purcell : A=2-20 mass region

- **ANL:** Filip Kondev, William Murrey(*) (DePaul U, Prof. S. Fischer's group)
  Collaboration with: Daryl Hartely (US Naval Academy) :
  NP-A, PL-B, JP-G journals

- **LBNL:** Coral Baglin

- Coordinator: Balraj Singh (McMaster)

- Management of database at NNDC: Jagdish Tuli, Tim Johnson, Ramon Arcilla

  (*): undergraduate student

Compilation of new papers on mass measurements since 2003

- 74 papers from 2008-2011 compiled, with new mass measurements for about 450 nuclei.

- These compilations are available on ORNL webpage: www.nuclearmasses.org

- Compiled data file for 2004-2007 is also available

- On request, data files have been sent to several researchers.

- This work is done at McMaster, currently by Michael Birch (undergraduate student) and B. Singh.